

SOME NEMATODES FROM AUSTRALIAN MARSUPIALS

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THE present paper is the third of the series relating to nematode parasites of our marsupials. The first (1938a) dealt with Filariidae, and the second (1938b) with Strongylidae (Trichoneminae), chiefly from Central Australian kangaroos and wallabies. We now give an account of a number of nematodes from various Queensland localities extending from the Gulf of Carpentaria to the coastal region adjacent to the New South Wales border. The species are distributed amongst the Filariidae, Spiruridae, Oxyuridae, and Trichostrongylidae.

This series of studies has been made possible by a Commonwealth grant to the University of Adelaide.

Oxyurids had not been recorded as occurring in Australian marsupials, but no less than four species, probably belonging to as many distinct genera, are described in this paper. Three of these were found in the preserved viscera (ileum and caecum) of a flying opossum, *Petauroides volans* var. *minor* collected by H. H. Finlayson on the Fitzroy River, Central Queensland, and forwarded to the South Australian Museum. Unfortunately this interesting assemblage of parasites is in a poor state of preservation. One of the forms has been assigned to a new genus, *Austroxyuris*. The fourth species was found in the common opossum, *Trichosurus vulpecula*, from South-eastern Queensland.

Only the female of the Spirurid, *Protospirura marsupialis*, was known previously. One of the two species of Filariids from the Gulf of Carpentaria is regarded as new, while the other, which was represented by immature females, is probably the female of one of our recently described species. The two Trichostrongylids belong to genera previously known from Australian marsupials, a second species being added to *Austrostrongylus* and *Filarinema*, which were monotypic, and described from material collected in zoological gardens in the United States and Pretoria respectively.

We are indebted for material to H. H. Finlayson, Honorary Curator of Mammals, South Australian Museum; Dr. F. H. S. Roberts, Parasitologist, Department of Stock, Brisbane; the late Dr. T. L. Bancroft and his daughter, Dr. J. M. Mackerras, formerly of Eidsvold, Burnett River. The types of the new species have been deposited in the South Australian Museum, Adelaide.

HOSTS AND PARASITES REFERRED TO IN THIS REPORT.

<i>Macropus robustus</i> Gould	<i>Dipetalonema robertsi</i> sp. nov.
<i>Macropus</i> sp.	<i>Dipetalonema annulipapillatum</i> Johnston and Mawson
<i>Macropus dorsalis</i> Gray	<i>Austrostrongylus minutus</i> sp. nov.
<i>Trichosurus vulpecula</i> (Kerr)	<i>Protospirura marsupialis</i> Baylis
	<i>Syphacia trichosuri</i> sp. nov.
<i>Petauroides volans</i> (Kerr) var. <i>minor</i> Collett	<i>Austroxyuris finlaysoni</i> gen. et. sp. nov.
	<i>Passalurus parvus</i> sp. nov.
	<i>Oxyuris</i> (s.l.) <i>acuticaudata</i> sp. nov.
<i>Isoodon obesulus</i> (Shaw)	<i>Filarinema peramelis</i> sp. nov.

FAMILY FILARIIDAE

DIPETALONEMA ROBERTSI sp. nov.

(Fig. 1-5.)

From the body cavity of *Macropus robustus*, from Normanton, North Queensland.

Male. 6.5 cm. long, 0.23 mm. in maximum breadth; female, represented by fragments of two specimens, one fragment being 11 cm. long with a maximum width 0.45 mm. Anterior end dome-shaped with papillae arranged in two rows, each with four large and two small (probably lateral) papillae. The cuticle possesses fine transverse striations which are not obvious except in the lateral lines, since they are masked elsewhere by deeper longitudinal markings. The lateral regions have each two irregular rows of "gland cells" or "pores". Mouth small, leading into a short vestibule, 6 μ long, with its base supported by a chitinous ring. Oesophagus about 2 mm. long in both sexes; with narrower anterior portion, 0.55 mm. in female. Nerve ring at about 0.28 mm. from anterior end.

Male. Testis tube extends as far forwards as the posterior end of the oesophagus. Tail 0.48 mm. long, with rounded tip which is apparently without papillae. Larger spicule 0.24 mm. long, cylindrical proximally but tapering to a fine point; shorter spicule 0.12 mm. long, broad, ending in a rounded tip. Three pairs of preanal papillae, somewhat irregularly arranged, one pair immediately postanal, and another pair some distance behind the latter and not quite symmetrically placed.

Female. Tail 0.4 mm. long, with two very small subterminal papillae. Uter-

ine tubes extend posteriorly to within 1.7 mm. from the anus; the two tubes unite just behind the vulvar region, the single uterus passing forward to within 1 mm. from the oesophagus before turning posteriorly as the vagina the latter forming a loop before entering a small muscular pyriform bulb at the vulva which lies at 6.5 mm. from the anterior end of the worm.

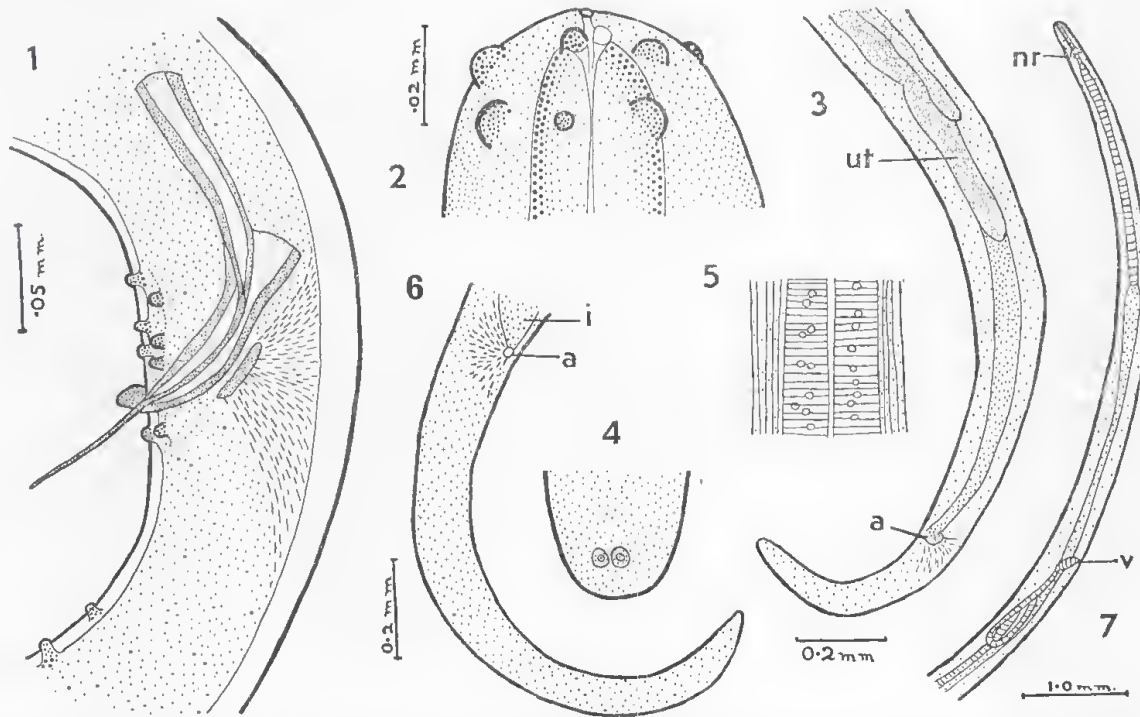


Fig. 1-5. *Dipetalonema robertsi*. 1. Cloacal region of male, lateral view; 2. head; 3. posterior end of female; 4. tip of female tail, ventral; 5. cuticle at lateral line. Fig. 6-7. *D. annulipapillatum*. 6. posterior end of female; 7. anterior end of female. Fig. 1 and 4 to same scale; 5 and 6 to same scale.

Explanation of lettering: a. anus; dr. dorsal ray; dt. dorsal tooth; edr. externo-dorsal ray; elr. externo-lateral ray; ep. excretory pore; g. gubernaculum; i. intestine; ic. inflated cuticle; nr. nerve ring; plr. postero-lateral ray; s. spicule; ut. uterus; v. vulva; vd. vas deferens.

D. robertsi differs from other species of the genus in the number and arrangement of the head papillae. The female system resembles that of *D. tenue* Johnston and Mawson 1938. The specific name is given in recognition of the excellent work now being carried out by its collector, Dr. F. H. S. Roberts. Parasitologist, Department of Stock, Queensland.

DIPETALONEMA ANNULIPAPILLATUM Johnston and Mawson 1938.

(Fig. 6-7.)

The material consists of two female specimens, both immature, taken from the dorsal aorta of *Macropus* sp., at Inverleigh, near the Flinders River, Gulf of

Carpentaria, North Queensland, by Dr. F. S. Roberts. The larger is 9.5 cm. long, 0.07 mm. wide at the head, 0.4 mm. in maximum breadth, and 0.12 mm. broad at the anus. The anterior portion of the head of each worm is damaged, but one can distinguish a chitinous ring around the mouth, and there appears to be outgrowths of the hypodermis into the cuticle resembling those occurring in *D. annulipapillatum*, of which species only the male has been described. The oesophagus is 2.6 mm. long, with an anterior narrower portion 0.6 mm. in length, and a wider posterior part. The nerve cord is situated at 0.3 mm. from the anterior end. The anus lies at 1.18 mm. from the tip of the tail. The uteri are not readily distinguishable because of immaturity. They pass forward to enter a muscular vagina a short distance behind the vulva, the vagina coiling on itself once before entering a pyriform muscular structure leading into the small vulva. The latter lies at 5.3 mm. from the anterior end. The long tail has a rounded tip on which papillae were not detected.

The characters present suggest that the specimens may be females of *D. annulipapillatum*, recently described by us (1938) from three species of wallabies, two of them from the Burnett River, Central Queensland, and one from coastal New South Wales. The main differences are the presence of a chitinous ring around the buccal region, and the differentiation of the oesophagus into a narrower and a wider region.

FAMILY SPIRURIDAE

PROTOSPIRURA MARSUPIALIS Baylis.

(Fig. 8.)

Baylis (1927) described only the female. Since our material contained both sexes, an account of the male can now be given. The host was the opossum, *Trichosurus vulpecula*, from Eidsvold, Burnett River, Central Queensland (collected by the late Dr. T. L. Bancroft and Dr. M. J. Mackerras) and from Brisbane.

The head and general features of the body have already been described by Baylis.

Male. About 3.5 cm. long, shorter and thinner than the female, and with two or three close coils at the posterior end. The distance from the anterior end of the head to the posterior end of the oesophagus is 4.05 mm. The thick-walled vestibule is 0.25 mm. long, with an internal diameter 0.07 mm. The nerve cord lies at 0.34–0.35 mm. from the anterior end, and just in front of the excretory pore. The tail has long alae, 0.22 mm. wide, narrowing near the tip, slightly beyond the end of which they project. The spicules are subequal in length, but

the left is thinner than the right, to which the vas deferens is attached. In one specimen the right spicule measured 1.15 mm. and the left 1.2 mm.; in another they were 1.3 and 1.1 respectively. A gubernaculum is present. The cloaca is slit-like, slightly elongated transversely, and lies at 0.7 mm. from tail end. There are four pairs of pedunculate preanal papillae, and a similar pair about mid-way between the cloaca and the tip of the tail. There is a pair immediately postanal, as well as two or three pairs of very small papillae close to the end of the tail. The alae are ornamented with longitudinal striations, and similar markings form a very narrow zone across the ventral surface of the body in the immediate vicinity of the cloaca.

FAMILY OXYURIDAE

AUSTROXYURIS FINLAYSONI gen. et sp. nov.

(Fig. 9-12.)

This tiny species was present in great numbers in the caecum and intestine of *Petauroides volans* var. *minor*, obtained by H. H. Finlayson in the Fitzroy River District, Central Queensland. The viscera in which the parasites were found were forwarded by the South Australian Museum. The state of preservation was poor.

Worms short, straight; male 1.7-1.8 mm. long; female about 2 mm. Cuticle with fine transverse striations. Maximum diameter of male 0.11 mm. of female 0.15 mm., occurring at the level of the posterior end of the oesophagus, the body then tapering to the tail.

Head end rounded, with cuticle not regularly inflated. Mouth circular, directed forwards, with its margin supported by a continuation of the chitinous wall of the buccal capsule. One pair of lateral papillae. Buccal capsule 0.01 mm. in diameter and 5μ long in the female, with a projection outwardly from the middle of its wall. Oesophagus 0.3-0.4 mm. long in the male (1.4.5-5.6 of body length); narrow, slightly constricted in front of the rounded bulb, the latter 0.035 mm. in diameter, and provided with valves. Anterior end of intestine swollen. Nerve ring at the end of the first third of the tubular portion of the oesophagus, and about 0.12 mm. from the head end. Excretory pore just behind the oesophageal bulb.

Male. A pair of symmetrical caudal alae with maximum width (each 0.01 mm.) at cloacal level, length 0.2 mm. Body narrowed suddenly just in front of the posterior end of the alae, continuing as a very thin tail 0.06 mm. long. A pair of adanal papillae; a median papilla immediately postanal; three lateral papillae just behind the anal region, arising close together, supported by long peduncles, one pair of these papillae being located at the widest part of the alae, the others

arising more ventrally. No papillae could be detected at the posterior end of the alae. Spicule single, short, cylindrical, 0.05–0.08 mm. long, not strongly chitinized except at its proximal end, where it joins the vas deferens and has a well-chitinized ring. Gubernaculum absent.

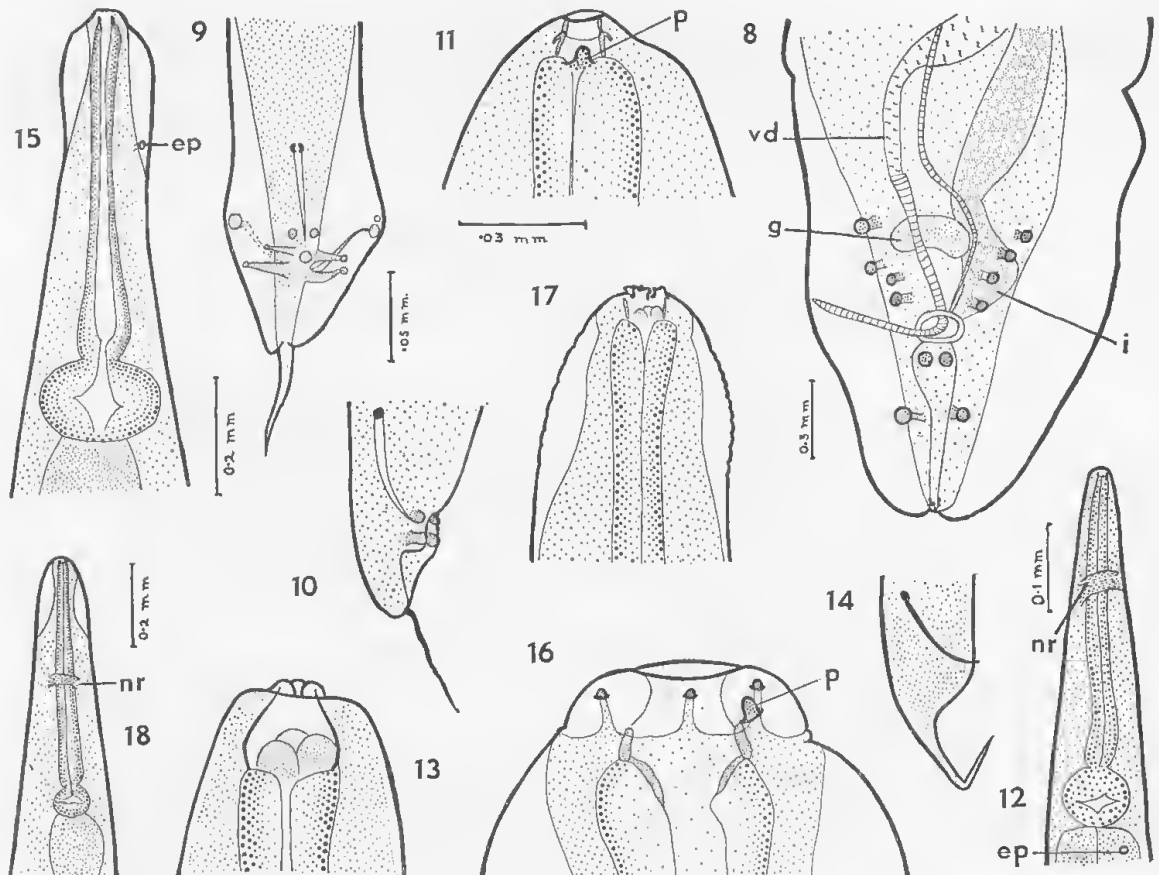


Fig. 8. *Protospirura marsupialis*. Posterior end of male. Fig. 9–12. *Austroxyuris finlaysoni*. 9. posterior end of male; 10. ditto, lateral view; 11. head, lateral; 12. oesophageal region, lateral. Fig. 13–14. *Passalurus parvus*. 13. head; 14. posterior end of male, lateral. Fig. 15–16. *Oxyuris acuticaudata*. 15. oesophageal region; 16. head. Fig. 17–18. *Syphacia trichosuri*. 17. head; 18. oesophageal region. Fig. 9, 10, 14 and 17 to same scale; 11, 13 and 16 to same scale.

Female. Tail very long, 0.29 mm. in length, tapering to a fine point. Vulva large, round, dividing the body antero-posteriorly in the ratio 1 : 1.8. Uteri very indifferently preserved, but appear to be divergent. Eggs not observed.

The species belongs obviously to Oxyurinae, near *Passalurus*, from which it differs chiefly in the characters of the vestibule, in the absence of a prebulbar swelling on the oesophagus, and in the absence of narrow cuticular flanges at the anterior end. Some of the features suggest those of *Protozoophaga*. A new genus *Austroxyuris* is proposed for it, and is diagnosed as follows:

Oxyurinae. Mouth simple with two papillae; cuticle without cephalic expansions; vestibule short, without teeth. Oesophagus with distinct bulb but without marked prebulbar swelling; excretory pore behind bulb. Male with alae, a pair of sessile adanal papillae, a median postanal, and three pairs of pedunculate postanal papillae; spicule, single, weakly chitinized, short; gubernaculum absent; tail short, resembling a spike. Female with very long tail, tapering to a fine point; vulva in anterior third. Type *A. finlaysoni*.

The species is dedicated to H. H. Finlayson, Honorary Curator of Mammals, South Australian Museum. In company with it were found the two Oxyurids, whose descriptions follow this account.

PASSALURUS PARVUS sp. nov.

(Fig. 13–14.)

Found in company with other oxyurids in *Petauroides volans* var. *minor*, Fitzroy River, Central Queensland.

Short worms, females 3–3.5 mm. long; single male found, 1.12 mm. long. Cuticle deeply annulate, finely striated longitudinally. Anterior end rounded. Mouth small, terminal, with three lips supported by chitinous prolongation from the buccal capsule. Two (perhaps four) small papillae at anterior end. Buccal capsule very large, 0.02 mm. long, 0.023 mm. wide at its base, with thin outwardly concave walls; three semi-circular teeth, 7 μ long, arising from the anterior end of the oesophagus. Oesophagus 0.52 mm. long in male, 0.63 mm. in female; with a constriction between the tubular portion and the spherical bulb. Nerve cord and excretory pore not observed.

The posterior end of the only male available is in an unsatisfactory state. The single spicule is 0.06 mm. long, more strongly chitinized at its proximal end. There is a short spine-like tail. The papillary arrangement was not recognizable.

The female has a narrow tapering posterior end, the tail being 0.42 mm. long and markedly ringed. Position of vulva not determined. Eggs thick-shelled, 0.03 by 0.01 mm., mostly with a thickening of the shell at one pole; embryos present.

The species belongs to a genus closely related to *Passalurus*. In view of the indifferent condition of the specimens, a satisfactory examination could not be made, and it has been considered advisable to place the species provisionally under that genus.

OXYURIS (s.1) ACUTICAUDATA sp. nov.

(Fig. 15-16.)

From caecum and intestine of *Petauroides volans* var. *minor*, Fitzroy River, Central Queensland. Only females were found. They were 6-8 mm. long, tapering gradually towards posterior end, with very finely-pointed tail, 1.4 mm. long. Cephalic cuticle inflated; body narrowed suddenly in the anterior 0.25 mm.; cuticle at extreme anterior end forming a collar 0.015 mm. in depth, surrounding oral aperture. Six minute papillae pass up through the collar and project about 1.5μ , a pair of larger papillae behind these. Buccal capsule wide, shallow, 0.016 by 0.007 mm. Oesophagus 0.7 mm. long, with wide lumen which narrows at the end of the anterior tubular portion, expanding again in the bulb; the latter wider than long. Nerve ring just in front of mid-oesophagus. Excretory pore in the vicinity of junction of first and second thirds of tubular part of oesophagus. Vulva strongly chitinized, lying at end of first quarter of the body length. Eggs 0.034 by 0.017 mm.

On account of the absence of males we prefer to assign the species to *Oxyuris* (s.1). It is certainly not a member of *Oxyuris* (s.str.).

SYPHACIA TRICHOSURI sp. nov.

(Fig. 17-18.)

From the intestine of *Trichosurus vulpecula*, West Burleigh, South-eastern Queensland. Only females present; 5 mm. long; with oesophageal cuticle inflated for 0.12 mm. from the anterior end, the body being narrowed in this region. Tail long, 0.8 mm. in length, tapering to a point. Vestibule small, 0.015 mm. long, 0.02 mm. wide, chitinized, with three small rounded teeth at its base. Oesophagus 0.6 mm. long, with a constriction between the tubular portion and the spherical bulb which is about 0.1 mm. in diameter. Nerve ring at 0.3 mm. from the anterior end and at about mid-length of the tubular portion of the oesophagus. Vulva at about midlength; vagina muscular; uterus long, single. Two ovaries. Eggs 0.05 by 0.025 mm., with very thick shells.

In most features the species agrees with those of *Syphacia*, but differs in possessing a definite vestibule and in having the vagina at mid-body. On account of the absence of males it is considered preferable to assign the parasite to *Syphacia*, all of whose previously described species occur in rodents.

FAMILY TRICHOSTRONGYLIDAE

AUSTROSTRONGYLUS MINUTUS sp. nov.

(Fig. 19–21.)

From the intestine of *Macropus dorsalis*, Eidsvold, Burnett River, Queensland. Male 2.9–3.1 mm., female 3.2 mm., all specimens probably immature; reddish when collected. These small thin worms were coiled in alcohol. There are six longitudinal ridges on the body, a ventral and a dorsal pair, in addition to a very wide lateral pair. Each of the latter is about 0.035 mm. wide, and the others each about 0.012 mm. They extend from the region just behind the inflated area almost to the end of the body, and in the case of the female reach to the anus. The lateral lines are longest. The transverse striae are about 1.6μ apart. Cuticle at head end inflated, but not striated, for a distance of 0.46 mm. Mouth small, circular. Buccal capsule dome-shaped anteriorly and funnel-like at its base, its chitinous walls being continued back into the oesophagus. Projecting into the base of the capsule is a relatively large dorsal tooth 8μ long in the male, 10μ in the female. There are also a smaller ventral and two small lateral teeth. The capsule is 7– 8μ long and 13– 14μ wide in the male, 10μ long and 18μ wide in the female. The oesophagus is 0.20 mm. long in the male (about one-sixteenth of body length) and 0.25 mm. in the female (one-thirteenth of body length), widening posteriorly. The excretory pore lies at about 0.16 mm. from the head end, and in the vicinity of the junction of the third and fourth quarters of the oesophagus.

Male. Bursa expanded laterally and nearly symmetrical; ventral lobes slightly separated from the laterals; small dorsal lobe. Ventral rays widely separated and subequal, the ventro-ventral curving antero-ventrally, the latero-ventral extending directly laterally. Externo- and medio-lateral rays stout, close to each other and parallel; postero-lateral ray much narrower than the other laterals. All ventral and lateral rays reach almost to the bursal edge, as also does each long narrow externo-dorsal which arises separately. Dorsal ray rather short, giving off two narrow curved branches at about half its length and then continuing a short distance before bifurcating into the short terminations. Spicules equal, 0.35–0.4 mm. long, about one-eighth of body length, narrow, cylindrical, curved at the distal end to meet each other at a blunt point. A long narrow chitinization of the dorsal wall of the spicule sheath probably represents a gubernaculum.

Female. The tail ends in long spine-like portion. Anus at 0.09 mm. from the posterior end. Vagina very short; ovejectors stout, relatively long; eggs not present; vulva at 0.31–0.35 mm. from tip of the tail, the distance being about one-ninth of body length.

A. minutus differs from the other known species, *A. macropodis* Chandler 1924, in the following features: smaller size, presence of lateral teeth in the buccal capsule, smaller dorsal tooth, rather shorter oesophagus, more posteriorly situated vulva, longer spicules, bursa much less markedly asymmetrical and of different shape, most of the bursal rays relatively stouter, and the different arrangement of the branches of the dorsal ray.

FILARINEMA PERAMELIS sp. nov.

(Fig. 22-25.)

From the intestine of a bandicoot, *Isoodon obesulus*, from West Burleigh, South-eastern Queensland. Male, 4.6-4.9 mm. long with a maximum diameter of 0.07 mm.; female, 5.8-6 mm. Head very small, and its parts are difficult to determine accurately. Head end with a very narrow euticular inflation extending back for about 0.05-0.06 mm., the underlying region being somewhat narrower than the succeeding portion. There appear to be six minute lips. Longitudinal euticular striations are present. There is no buccal cavity, the oesophagus reaching the anterior end. A tooth could not be recognized, though in a few specimens a tooth-like structure seemed to be protruding from the end of the oesophagus through the mouth. Oesophagus 0.35-0.38 mm. long, thin, widening slightly towards its base. Intestine narrow. Nerve cord and cervical papillae not observed. Excretory pore quite distinct and lying in the vicinity of the mid-oesophagus, about 0.22 mm. from the head end.

Male. Bursa large, consisting of two large lateral lobes and a dorsal lobe, laterals with lower edges inturned. Ventral and lateral rays more or less equal in length and thickness, and all extending practically to the bursal edge; all of them arise together from a common stem, diverging in their distal third. Ventrals separate; ventro-laterals curved ventrally; postero-laterals slightly curved; externo-laterals nearly straight; medio- and postero-laterals bending rather dorsally. Dorsal ray stout and long, the externo-dorsals arising as stout curved rays from the end of its proximal third; the main stem continues a short distance and then gives off two short thin lateral branches, the main portion proceeding backwards to divide ultimately into two small bidigitate rays almost reaching the bursal edge. Spicules 0.14-0.15 mm. long; anterior part cylindrical, 0.015 mm. in diameter; widest near middle; eventually subdividing to form three pointed processes, two shorter laterals, and a longer median. The lateral structures are comparable with the whip-like processes described by Mönning for *Filarinema flagrifer*. The gubernaculum is spindle-shaped. There are two minute prebursal papillae.

Female. Tail 0.08-0.09 mm. long, tapering to terminate in a median ventral

and two latero-dorsal conical processes, the ventral cone bearing on its dorsal surface a spine-like process 0.012 mm. long. Vulva 1.13 mm. from the posterior end and protected by a thin flap arising in front of it. Vagina short; ovejectors muscular; uteri divergent.

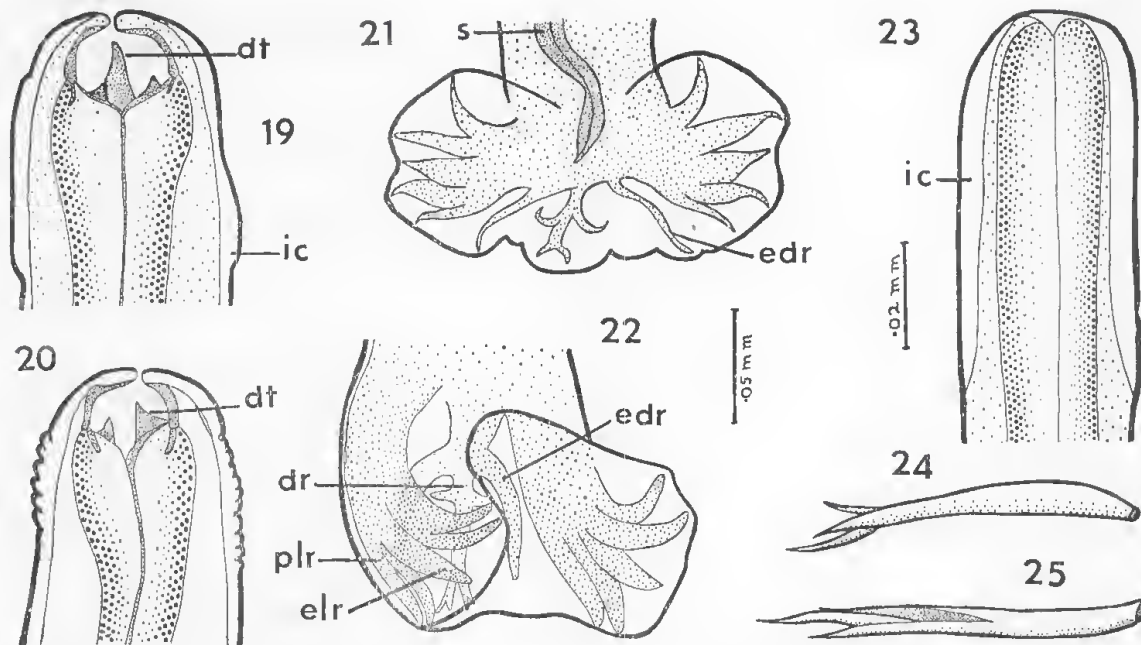


Fig. 19–21. *Austrostrongylus minutus*. 19. head, ventral; 20. head, lateral; 21. bursa, dorsal. Fig. 22–25. *Filarinema peramelis*. 22. bursa, ventral; 23. head end; 24. spicule, lateral; 25. spicule, subventral.

Fig. 19, 20, and 23 are drawn to scale adjacent to fig. 23; 21, 22, 24, and 25, to scale beside fig. 22.

The specific name is derived from *Perameles*, the generic name under which most Australian bandicoots were formerly placed. *F. peramelis* approaches most closely to *F. flagrifer* Mönnig 1929, from *Macropus rufus*, but differs in size; the presence of cuticular cephalic inflations and longitudinal striations; the form of the spicules; and the characters of the dorsal ray. The difference regarding the branching of the dorsal ray may be of generic value, but we prefer to place the species under Mönnig's genus because of the similarity of most of the other characters.

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